

## ***Interactive comment on “Resuspension and estuarine nutrient cycling: insights from the Neuse River Estuary” by D. R. Corbett***

**R. Peterson (Referee)**

rpeters2@coastal.edu

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This manuscript examines the role that sediment resuspension can play in supplying benthic nutrient fluxes to the overlying water column. Using a combination of porewater nutrient profiles and bottom water sampling, the author finds that advection of nutrients to the water column associated with sediment resuspension can greatly increase these benthic nutrient fluxes and suggests that prior research which only considers diffusional inputs may be underestimating these fluxes. These findings being to light another, previously overlooked process that can control estuarine nutrient dynamics. I believe one of the strengths of this manuscript is the length at which the author put his findings into context by comparing to previous papers. This certainly validates the findings in this manuscript and also helps drive home that these advective resuspension events

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can be greater in magnitude than diffusional inputs. I find the methods to be of sound quality and the interpretations to be quite logical and well explained. I believe that the manuscript is acceptable for publication with only a few minor adjustments.

Specific Comments:

(1) I would encourage the author to examine the  $\text{NH}_4/\text{NO}_3$  ratio in porewater and bottom river water to indicate the redox states of those waters. Charette and Buesseler (2004, L&O vol. 49) suggested this ratio would indicate reducing (high ratio) and oxidizing (low ratio) conditions, and it would be interesting to see if these behaviors are evident in this data set. I am inclined to think not, as the  $\text{NO}_3$  levels are apparently quite low throughout the system, but it could be an interesting exercise nonetheless.

(2) Despite the fact that this paper is not focused on the methods by which the author determines resuspension events, I feel that this section of the text (section 5.3) is somewhat under-explained. While a reference (Dillard, 2008) is given to the prior results that this section is based on, the reference is to a M.S. thesis which can be relatively inaccessible to most readers of this journal. My specific questions relating to this section are: (a) Can you validate the observations with some independent method (e.g., turbidity monitoring data)? (b) By examining the net change in Be-7 inventory, do the authors only consider the inventory within the uppermost 5 cm of sediment (as mentioned in line 23, page 2777) or the entire sediment depth containing Be-7? (c) Does this method account for the seasonal Be-7 atmospheric flux variability to land and water surfaces? It seems that several other environmental factors (Be-7 content on riverine particles, TSS concentration, DOC concentration) could influence the Be-7 inventory in sediments.

(3) I find Section 6.3 particularly interesting. One point left unaddressed in this discussion is the role of nutrient recycling (continually between the water column and the sediments) versus new nutrient inputs. For example, the second sentence of that section details that total N in the estuary has remained unchanged since new regulations

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have been in place to control N loading. Perhaps the level of 'new' N has decreased, but the N in the estuary is constantly being recycled between the river and the sediments?

(4) I find Figure 4 to be somewhat difficult to interpret. I understand why the author opted for a contour plot here, and I applaud the creativity. However, I am concerned that by displaying the data in such a contouring style, the author is suggesting nutrient concentrations at times between the sampling events that cannot be validated. While the contouring along the y-axis dimension is genuine, I believe the x-axis oriented contouring may be an artifact of the contouring that some readers may interpret to be real. Also, there seems to be some vertical stretching that has altered the y-axis labels.

Technical corrections:

(1) I felt like that a direct statement on the aim/scope of the paper somewhere in the Introduction could help the reader follow a bit better

(2) Page 2773, line 20: Change 'Theses' to 'These'

(3) Page 2776, lines 3-6: Several months are mentioned here, but none of these months appear in the x-axis labels of that figure (fig. 4). At a glance, this caused a bit of confusion until I studied the figure a bit more. Consider re-labeling the x-axis with just the month names that correspond with the sampling events instead of every other month.

(4) Section 6.1: In listing the possible reasons why the results here differ somewhat from other studies, another possible reason (related to the sampling of bottom water) could be that the hypoxic conditions in those bottom waters would not have the capacity to fully oxidize NH<sub>4</sub> to NO<sub>3</sub>, so the NH<sub>4</sub> remains higher and NO<sub>3</sub> is lower than other studies have reported.

(5) Page 2782, lines 2-4: I don't believe the sentence beginning with 'Comparisons' is a complete sentence. Please check.

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(6) Page 2782, line 15: Please change 'fram' to 'frame'

(7) Page 2782, line 18: Is it safe to assume the removal event occurred over 24 hours? Can you use wind records to better constrain this assumption?

(8) Figure 3: the caption indicates that precipitation is shown in the figure, but I don't see the data there. Please review and revise.

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